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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

Date: April 29, 2003

Subject: Comments on
Determination of Source of
Radioactivity in Soil Samples
Dusable Park, Chicago, IL
Dated December 12, 2002

From: Bob Kay, Geologist
Remedial Response Section #5

To: Fred Micke
Remedial Project Manager

Fred, I have looked over the subject document and some of the supporting reports. My comments are as follows:

1. Coal was clearly present at this site in the past, and apparently some remains there today. As the literature provided by Kerr-McGee points out, monazite commonly is a component of coals and monazite contains thorium. Thorium concentrations in 16 samples of coal from Illinois presented in the USGS Coal Quality database at

<http://energy.er.usgs.gov/coalqual.htm#submit>

ranged from 1.1-7.2 ppm with only one sample being above 6.0 ppm. Thorium concentrations in approximately 300 samples of coal from Illinois, Indiana, and Kentucky ranged from 0.4-18 ppm with only 5 samples being above 6 ppm. U concentrations in the coals are similar, but other radioactive elements such as Ra were not included in the analysis. These concentrations are not (to my knowledge) convertible to concentrations in picocuries per gram and there are differences in the sample matrix, so concentration information cannot clearly be used to identify the Th source at this site. However, these values mean that Th likely represents less than 0.0006 percent of the weight of the coal sample.

It should be noted that although Th concentrations in coal ash would be expected to be concentrated by about a factor of 10 over the concentrations in coal, I can find nothing in the report to indicate coal ash is actually present in the C and B2 samples. This may be a matter of wording or the level of description, but the report describes Al, Fe, Si, Ca-rich slag as being present. Ash or any other material derived from the burning of coal is not explicitly mentioned

as being present. I did not observe the sample, but calling the material slag (not ash or cinder) the description of the material, and its chemical composition gives leads me to think the material described as slag is produced from steel manufacturing (or gas mantle manufacturing?) rather than being coal ash. In any event, Th concentrations associated with the slag particles were determined to be inconsequential, so even if coal ash is present, there is nothing in here to indicate it is a significant source of radioactivity.

It is my understanding that monazite also was used in the manufacturing of the gas mantles, so the mere presence of monazite does not automatically and uniquely identify a source. Again, I was not there for the sample collection and processing, but as near as I can tell there is no proof the monazite came from the coal material, as opposed to another part of the sample. Just because the sample with the coal contained monazite doesn't necessarily mean the coal is the sole or even the primary source of the monazite. Given the small amount of Th in coal, the probability of a uniform Th concentrations in the coal, and the apparently homogenous distribution of the coal in at least broad areas of the park, it seems possible that the elevated radioactivity associated with the small sample sites identified by the screening in area C represent a concentration of monazite from manufacturing wastes rather than an especially radioactive chunk of coal.

The presence of "natural siliceous gangue particles" in the C sample denotes presence of material potentially associated with mineral processing, which seems consistent with the presence of waste materials derived from the processing of monazite-rich sands for gas-mantle manufacturing. Given that sand (a natural material rich in silicate minerals) was apparently the source of the monazite used in the manufacturing process, the presence of "natural-mineral particles" in the B2 samples also does not particularly indicate that whatever Th is present here is not derived from manufacturing waste. Again, this may be a matter of terminology.

Speaking of terminology, I am somewhat confused by the somewhat interchangeable discussion of radiation. Although the report is consistent in its discussion of Th, the cover letter cites radiation-level concentrations associated with ash, then mentions radium concentrations in samples collected at DuSable park. These are not interchangeable terms.

2. In summary, I'm of two minds here. If it can be determined that the monazite came from the coal in sample C, and if a reason can be found why the coal in the hot spot is more radioactive than the rest of the coal, I would be inclined to agree with Kerr-McGee as to the source. If the monazite is present in the sample as discrete particles, or is associated with the gangue material, a waste material is indicated.

I hope this review has been of use to you. Feel free to call me at 6-7938 if you have any questions or comments.

cc. S. Padavoni